Appendix C: Product Plan Instructions

Product Plan—A description of the work to be performed and the resources needed to accomplish the goals and objectives established in the customer agreement. In QMS terminology, the Product Plan is the *QUALITY PLANNING DOCUMENT* for producing the product. The Product plan includes the *design planning information* and the *process management information*.

Figure 1 is the table of contents to be followed by all Teams in generating their Product Plan. All components shall be addressed, but the level of detail is left to the Team based on product complexity and customer needs/expectations.

ISO 9001 standards require certain quality control processes to be documented. Those processes that are required and the criteria that they must meet are described in Appendix F. Samples of these required processes that meet these criteria are in the Library of Approved Team Processes (see http://isc.gsfc.nasa.gov/ISO9k/ISO9001.htm). Each team in their product plan may either refer to one or more specific approved processes, or develop and document their own processes. Any new processes must meet the criteria specified in Appendix F and be approved by the ISD QMS representative. The effective date of the Product Development Handbook being used is to be placed directly under the Product Plan "Table of Contents" label on the "Table of Contents" page and should be labeled as "Version Date xx/xx/xx". This effectively freezes the version of the Product Plan Table of Contents for the duration of the Product Plan.

The following disclaimer should be placed in the footnote section of every page:

> "Printed copies of this document are for **REFERENCE PURPOSES ONLY**! The only controlled copy of this document is located on-line at http://xxxxxxxx."

Optionally for Product Plans originally signed prior to ***8/1/99***, this disclaimer may appear directly after the signature page:

> "References to documents and data (hard copy or electronic) in the Product Plan ***not*** directly under the Team's control shall contain the version identification in the Product Plan."

The Work Order Authorization (WOA) equivalent for software development referred to in the GSFC QMS is defined by the contents of Sections 3.1 and 4.2.1 of the ISD Product Plan, including all associated documentation and references.

Section 1 of the Product Plan (Customer Agreement) may be under either Project or ISD control. It follows the configuration management process outlined in Section 1.15. A customer signature for the Section 1 of the Product Plan is highly recommended (see Figure 2).

The remaining sections of the Product Plan are under ISD Configuration Management and follow the configuration management process defined in Section 4.2.1. At a minimum, these portions of the Product Plan require a Team Lead signature and an appropriate ISD Management Team signature for approval (see Figure 3).

The remainder of this appendix lists the product plan subsections with a description of the contents following each subsection heading. Quality records and controlled documents are identified in tables in the appropriate subsections. Tables labeled as objective evidence indicate other records that should be maintained by the Team, but are not included on either the quality records list or the controlled documents list.

Certain subsections may be included by reference if documented elsewhere. These subsections are identified with an asterisk (*). It is recommended that subsections containing frequently changing information be included by reference.

Table of Contents for Product Plan

Table of Contents—Product Development Handbook -Version Date: xx/xx/xx

Document Change History—Include version identifier and description of change
Customer Agreement Signature Page
Product Development Signature Page
1. Customer Agreement
2. Management Approach
3. Technical Approach
4. Product Assurance
5. Plan Update History

Appendix A—Acronyms and Abbreviations

Appendix B—References

Figure 1. Template for Table of Contents

NOTE: See following pages for detailed information on contents of each section.

Customer Agreement

for the

(project name)

(system type[1]) Development

Release Date

Month/Year

Prepared by: _____

XXXXXXX
Team Lead

Approved by: _____

XXXXXXX
Customer/Designee

Approved by: _____

XXXXXXX
Information Systems Division Management Representative [2]

The Team Lead, the Customer/Designee, and the Information Systems Division Management Representative constitute the Configuration Control Board for the Customer Agreement portion (Section 1) of this document.

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FIGURE 2. Template for Customer Agreement

Notes: (1) System types—This would be ground data system, flight software, command and data handling system, etc.

(2) Information Systems Division Management Representative—Title listed here should be the specific title of the ISD manager responsible for the development, for example, "Code 5xx Branch Head"

Product Development

for the

(project name)

(system type[1]) Development

Release Date

Month/Year

Prepared by: _____

XXXXXXX
Team Lead

Approved by: _____

XXXXXXX
Information Systems Division Management Representative [2]

The Team Lead and the Information Systems Division Management Representative constitute the Configuration Control Board for this document, with the exclusion of the Customer Agreement (section 1).

Disclaimer

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FIGURE 3. Template for Product Development

Notes: (1) System for types—This would be ground data system, flight software, command and data Handling system, etc.

(2) Information Systems Division Management Representative—Title listed here should be the specific title of the ISD manager responsible for the development, for example, "Code 5xx Branch Head"

1.0 Customer Agreement (GPG 1310.1)

1.1 Background

A brief (maximum of one paragraph) description of what larger effort/activity this Team is supporting and how this product fits into the larger picture.

1.2 Team Charter

A brief one-paragraph description of what this Team is being asked to accomplish, including any time constraints or interface boundaries within which this Team is expected to operate.

1.3 Customer(s) Identification

The customer is usually a Flight Project or the person who pays the bill. Otherwise, it should be the person who will define the requirements and accept the products.

1.4 Customer Goals and Objectives

Any special things that the customer wants to accomplish (e.g., rapid turn around, new architecture, special COTS requirements, special experiments, etc.) through this Team's activities.

1.5 Requirements*

This section should list or reference (preferred) any functional/operational requirements as specified by the customer. Include any specific standards to be met and list the interface control documents needed. Include any policies and practices of Electrical Engineering Division (EED) or specific Projects for devices connecting to flight hardware. References must include revision date/number for documents not under direct control of Team Lead. Do not include technical interface documents or databases here. Reference them in Section 2.4

Controlled Document	Comment	Record Held By
Functional Requirements	Signed and dated by Customer	Project or Team Lead

1.6 Deliverables

List products to be delivered for each phase, including software, hardware, licenses, documentation, etc., as directed by customer.

1.7 Schedules*

List *customer—specified* schedule requirements, including such items as documentation, releases and reviews.

1.8 Necessary Customer Training

Specify who is to be trained how many are to be trained, location and nature of training.

1.9 Medium/Method for Product Delivery (GPG 6400.1)

List any required delivery medium and method of delivery for all products listed in Section 1.6

Quality Record	Comment	Record Held By
Shipping Records		Team Lead

1.10 Product Destination

List product delivery destination for all products listed in Section 1.6.

1.11 Post Delivery

Describe who will do maintenance after and how it will be requested/approved. Describe process that will be used for maintenance activities for all products in Section 1.6

1.12 Customer-supplied elements, both technical, and resources (schedule, medium, and interfaces)

List any technical elements supplied by the customer that will be used in the production, testing or packaging/delivery of the product. Do not include funding. Include delivery schedule and medium of supplied items.

1.13 Customer involvement (roles, responsibilities, authority, accountability)

Provide details on the extent of direct customer involvement with the Team (Attends Team meetings? Reviews results? Provides direction? Etc.)

1.14 Acceptance Criteria*

Describe the customer's criteria for determining when the product is completed, (i.e., when will the customer accept the product?) This is usually demonstrated by having a satisfactorily completed test matrix/set of test plans. Customer verbal acceptance is not sufficient.

1.15 Customer Agreement Review and Update Process

Describe the process used to evaluate and approve changes to the customer agreement. Be sure to note that the Team will be evaluating the changes to assure that they have the capability of providing the requested changes. Approval authorities (those listed on the signature page) must be listed specifically by name and title. It must be stated that they consist of the Change Control Board (CCB) or the CCB process/membership must be described or referenced. The original approval authority must approve changes.

2.0 Design Planning and Interface Management (GPG 8700.1)

Controlled Document	Comment	Record Held By
Product Plan	Signed and dated by the CCB which is listed in Plan—usually Team Lead, Branch Head, Customer.	Team Lead
Design Planning Materials • Review Plan • Development Phases	May be in product plan.	Team Lead

Objective Evidence	Comment	Record Held By
Design Planning Materials • Team Work Assignments • Team Organization • Schedules • Budgets	May be included in product plan by reference.	Team Lead

2.1 General development approach

Describe in a sentence or two the general philosophy that will be used to build the product, discussing such aspects as use of commercial-off-the-shelf (COTS), contractor involvement, schedule constraint, use of a particular development methodology or new technology, etc.

2.2 Resources needed (budget, people/skills, and facilities)*

Indicate where the *official* budget is kept. In most cases, the budget will probably reside with the Project. Budget information should be kept by fiscal year, and include both civil servant manpower and any contractor support. Address any specific facilities or any facility modifications required for use in development or testing and their expected required dates.

2.3 Team Organization

2.3.1 Team Organization

Include an explanation or diagram illustrating the organization of the Team personnel and its activities. Note: Any Team organization chart not included in the product plan must be signed and dated. Include the relationship of the Team Lead to the higher level Project organization, if applicable.

2.3.2 Roles, Responsibilities, Authority, Accountability of Team Members*

Describe the method used to assign work to Team members and document the work assignments. Assignments can be made by subsystem (e.g. Command & Data Handling, Planning & Scheduling) or by work function (e.g. testing)

2.3.3 Decision making and conflict resolution process

Describe the method used to resolve conflicts within the Team. If group decisions are used, identify the tiebreaker or ultimate decision authority.

2.4 Team interfaces to other teams, organizations, or groups

Describe any interfaces to other organizations, teams, or groups necessary in developing the product, and a *brief* description of the purpose of each interface. This may include things such as the interface of the ISD flight software team to the flight hardware group for working compatibility issues, or the interface of the Ground Data System to the Flight Operations Team for acceptance of the system.

2.5 Procurement* (GPG 5100.1)

Describe all hardware and software purchase requirements in detail (i.e., What are you going to buy?) Include any purchases necessary for facility modification. If you are using contractor support, list the contractor name and contract number. If special or usual contracting arrangements are required, describe them. Reference the procurement process used to make purchases. Be sure to use RITS for all items within scope.

Quality Record	Comment	Record Held By
Purchase Requests		Team Lead or Team procurement person

2.6 Team training plan* (GPG 3410.2)

Identify any QMS Required Task Specific training need for each Team member. When training is complete, document it by keeping a list of name, course, and date completed. (QMS Required Task Specific training is defined as training that must be taken to acquire new skills or enhance current skills required to perform tasks of that position that affect quality. Examples are Hand Soldering Certification, Electrostatic Discharge Awareness Training, Laser Safety, Cleanroom Procedures, Range or Launch Safety Training, Flight Operations Team Certification, or any required Project-specific training)

Quality Record	Comment	Record Held By
Records of Required Training Needed		Team Lead or Project
Records of Required Training Completed		Team Lead or Project

2.7 Risk mitigation

Describe any areas where there is a special risk to the delivery of the product (if any) and describe how it will be addressed. If there is none, state that.

2.8 Security

Describe the plans for addressing security considerations, both physically for the facilities involved and electronically for any computer systems being used either for development and testing or as a part of the final product.

2.9 Detailed Schedules*

This should be the detailed schedule used to manage the Team's activities. It should contain the Team life cycle schedule including facility preparations, procurements, system development by phase and release, product delivery, and maintenance (if applicable). Make sure to include review dates, documentation, interface control document's (ICD's) delivery dates; test dates, software release dates, procurements, and external deliveries to the customer. It should include and be consistent with customer schedules defined in Section 1.7.

2.10 Technology and commercialization plan

This should describe any technology advancement, technology infusion, and commercialization initiatives that are drivers for any aspect of this product plan. Especially describe any initiative for which the corresponding product plan activities would not be performed if the technology or commercialization initiative was not considered. If there is none, state that.

3.0 Technical Approach

3.1 Design Development (GPG 8700.2)

3.1.1 Product Requirements*

Describe (or reference) the derived requirements/specifications developed by the Team and approved by the Customer. These should include assumptions, interfaces, and performance information. Ensure that requirements are testable. These requirements can be the customer's original requirements (if so, just reference Section 2.3) or can be those derived by the Team itself.

Controlled Document	Comment	Record Held By
Derived Requirements	Signed and dated by Customer and Team Lead	Project or Team Lead
Interface Control Documents	Signed and dated by Representatives of Interfacing Organizations	Project or Team Lead

3.1.2 Product Design*

Describe the design of the product that the Team is planning to produce. Describe how changes in design are updated and traced to changes in the requirements.

Quality Record	Comment	Record Held By
Completed Design Documentation	May include: • High-level architecture description • Design Review Materials • Design Documents	Team Lead

3.1.3 Development Strategy

Describe at a HIGH LEVEL the software components you will build, the commercial off-the-shelf/Government off-the-shelf (COTS/GOTS) or customer supplied items you will use, the prototyping plans, and the integration requirements.

3.1.3.1 Buy Approach* (GPG 5100.1)

Describe any special purchasing strategies for items specified in Section 2.5.

3.1.3.2 Build Approach*

Include the development phases, the sequence of builds, the high level inputs and outputs per build, vendor/customer/prototype elements to be integrated, and the high level functional requirements satisfied in each build.

Quality Record	Comment	Record Held By
Completed Build Plan	Part of software work order authorization (WOA)	Team Lead

3.1.3.3 Prototyping Approach*

Describe any prototyping activities required to develop the product and the purpose for the prototype (i.e., what specific questions are to be answered by the prototype?)

3.1.3.4 Customer Supplied Products Approach

List and briefly describe any software that will be received from the customer for integration into the final product, and any assumptions concerning them.

3.1.4 Product Testing

3.1.4.1 Product inspection and test * (GPG 5330.1)

Describe the testing approach from unit through product delivery (including in-process and final inspection). Reference your test plans and discuss your testing approach for unit, build, and acceptance testing, test team (developers, independent, customer), test data (simulator, supplied data, flight hardware, real data), and any acceptance criteria (particularly any from the customer for final acceptance—Section 2.11). Describe how changes in design are mapped to changes in test plans.

Controlled Document	Comment	Record Held By
Documentation of Verification Activities	Include one or more: • Unit Test Plans • Code Reading Checklist • Design Baseline • Integration Test Plans • Build Test Plans	Team Lead

Quality Record	Comment	Record Held By
Documentation of Verification Activities	Include one or more: • Unit Test Results • Code Reading Signoffs • Design Walkthrough Documentation (including issues and resolutions) • Integration Test Results • Build Test Results	Team Lead

Controlled Document	Comment	Record Held By
Documentation of (End-to-End) System Validation Activities	**Include one or more:** • High Level Description of Test To Be Run (Can be in Test Procedures) • Test Validation Matrices • Detailed Description of Tests with Inputs, Expected Outputs, and Step by Step Procedures for Running the Tests • Acceptance Criteria	**Team Lead**

Quality Record	Comment	Record Held By
Documentation of (End-to-End) System Validation Activities	Include one or more: • Validation Matrices • Validation Test Results	Team Lead

3.1.4.2 Incoming inspection and test (GPG 4520.2)

For purchased items, including hardware, document the Receiving Inspection Instructions to describe special receiving instructions and tests if other than kind, count and condition. Be sure that all in-scope products received after May 1, 1999, are identified and entered into the RITS system.

Quality Record	Comment	Record Held By
Receiving Inspection Instruction (RITS entry)	RITS entry made by Team Lead or Team purchase person	Team Lead or Team purchase person
RITS Work Order Authorization (WOA)		Team Lead

Incoming Inspection Nonconformance Report	See GPG 5340.2	Center Nonconformance Reporting/Corrective Action (NCR/CA) System

3.1.4.3 Statistical Techniques* (GPG 8070.2)

Unless the Team determines a need for statistical testing of the product or other statistical methods, include the following paragraph in this section of your Product Plan.

"The Team has evaluated the need for statistical testing of the products developed under this Product Plan and has determined that statistical techniques are not required."

Examples of statistical techniques being used are (1) techniques to obtain reliability of hardware systems and (2) comparisons of output results after a platform language conversion. If statistical techniques are being used, then the procedure for their use must be documented.

3.1.5 Development Status*

3.1.5.1 Design/Implementation Status

Describe the method(s) that will be used to track the status through this phase of the product.

Objective Evidence	Comment	Record Held By
Status Information	May include: • Schedule Charts with Status Indicated • Module-by-Module Checklist • Configuration Management Records • Documentation of Weekly Status Meetings	Team Lead or designee

3.1.5.2 Testing Status

Describe the method used to track testing status of the product throughout its life cycle.

Objective Evidence	Comment	Record Held By
Test Status Information	May include: • Test Status Chart • Weekly Test Meeting Status • Signoffs of Completed Tests in Test Plan or Procedures	Team Lead or designee

3.1.6 Development Environment

Describe the development and test hardware and locations, and all Team development standards, as appropriate.

3.1.7 Technical Review Program (GPG 8700.4)

Describe the types of reviews you plan to have and the membership of the review boards. This should include a discussion of any code or design walkthroughs you plan to use as verification of the design. You must have at least a requirements review, a design review, and a product acceptance review with the customer where requests for action (RFAs) and responses are kept. Peer reviews as defined by GPG 8700.6 may include team reviews where one team member reviews another team member's work and should be included on the Team review plan. Project related reviews and other higher level reviews may be supported as requested and they should be listed in the Project Plan.

Quality Record	Comment	Record Held By
• Requests for Action (RFAs) and Responses from Review Meetings • Review Meeting Notes with Action Item List and Resolutions	Include One	Team Lead or CCB Chair

3.2 Process for handling, storage, packing, marking, preservation and transportation (GPG 6400.1)

List the medium for the various products to be delivered if different from Section 1.6 and state how they will be delivered to the customer. Describe any plans (such as back-ups) to prevent loss or damage to the product in all phases of development, including software, documentation and hardware.

3.3 Servicing

Describe the process for post delivery product maintenance (i.e., How do you plan to meet the requirements specified in Section 2.8?) Address responsibility for the maintenance, request process, process for doing work, and product redelivery for custom, government off-the-shelf (GOTS) and COTS software and hardware.

Quality Record	Comment	Record Held By
Maintenance requests		Team Lead
Redelivery letters		Team Lead

4.0 Product Assurance

4.1 Product Quality Assurance

4.1.1 Control of Nonconforming Products and Corrective Action* (GPG 5340.2/ GPG 1710.1)

Describe the process for recording and correcting problems in a "minor" Nonconformance Reporting (NCR)/Corrective Action system. Include a description of the process used to evaluate the cause of the problem and to assess whether any changes need to be implemented to prevent future recurrences. The minor NCR system should include the version or release number where the problem was found and ideally, the version number that includes the corrections. Nonconforming products are both identified by their associated NCRs and the associated release numbers. Any products released to the customer will include a ***release letter*** listing the release number, the included capabilities of the release, and a description of any remaining nonconformance in the release. Products with remaining nonconformance may only be released to the customer with proper approval. (See Library of Approved Team Processes or Criteria 7 in Appendix F.) The Center nonconformance reporting/corrective action (NCR/CA) system shall be used if no minor nonconformance system exists or if the nonconformance meets the Center wide criteria listed in the GPG.)

Quality Record	Comment	Record Held By
Nonconformance records from minor NCR system		Team Lead or Nonconformance Lead
Nonconformance records from Center NCR system		Center NCR system
Corrective Action Plans	May be in NCR system	Team Lead or Nonconformance Lead
Product Release Letters		Team Lead

4.2 Configuration Management (GPG 1410.2)

4.2.1 Control of Team software, hardware, documentation, and data*

Describe how your Team does configuration management for your software, hardware and documentation and who has the change

authority for each. If you use the Project's process for any of those, reference where their procedures can be found. Describe the signature and change authority for the development sections of the Product plan. Describe the method used to uniquely identify versions of the software and the elements from which it is built. The use of a commercial configuration management tool is strongly recommended for environments where one is available. If on-line copies of documentation or software are considered the controlled copy, then the approval authority must control on-line access. A list of documents and data under configuration management by the team is to be referenced in the Product Plan in this section. The list is to include the document or database name, the date or version identification of the current version, the location of the documents or database, and the person responsible for the item. Note: Any data bases or web sites containing controlled information directly under the Team's control shall contain a header identifying what is being viewed, as well as the date of the last change and person responsible for its control. (See Library of Approved Team Processes or Criteria 2B and 2B in Appendix F.)

Quality Record	Comment	Record Held By
Software CM records		Team Lead (or Configuration Manager)
List of items under configuration management		Team Lead (or Configuration Manager)
Copy of signature page of configuration management item		Team Lead (or Configuration Manager)
Records of CCB approval		Team Lead (or Configuration Manager)

4.2.2 Control of test software and hardware (GPG 8730.1)

Describe anything used to test the product, which may be both hardware and software. Describe how this software will be validated (i.e., how do you convince yourself that the simulator is working properly?) If the software used for testing is not the final validation, but is only used as part of a self-check, where neither the test software or the product being tested is considered correct until the final results are correct, then describe that test scenario. Describe or reference the configuration management process used to ensure the appropriate version of the simulator is used. See Library of Approved Team Processes or Criteria 4 in Appendix F. Also, discuss any inspection, measuring and test equipment (IMTE) being used and any calibration requirements.

Controlled Document	Comment	Record Held By
Documentation of Test Software Verification Activities	Include one or more: • Test Plans • Acceptance Criteria	Team Lead

Quality Record	Comment	Record Held By
Calibration records and calibration due dates for IMTE Team is using		Team Lead
Test software test results		Team Lead
Records of Verification from Contractor		Team Lead

4.2.3 Quality Records* (GPG 1440.7)

Identify the Team's Quality Records Coordinator (person who keeps the Quality Records List) and the location of the Quality Records List. Describe the process by which an element is added to the Quality Record List by the Coordinator and filed with the Custodian.

Controlled Document	Comment	Record Held By
Quality Records List		Team Lead

4.2.4 Control of customer supplied products* (GPG 5900.1)

Describe the method that will be used to check out or test the software or hardware supplied to you by the customer for inclusion into the product or for testing or packaging of the product. If a customer provides items for use by the Team in the development/testing of the product, describe the process used to report any problems with the item(s) back to the customer. Describe the configuration management process for customer supplied elements listed in Section 1.12 for changes initiated by the Team or by the customer. Include any other processes used to safeguard customer supplied products. (See Library of Approved Team Processes or Criteria 3 in Appendix F.) This section should address simulators, test data, software algorithms, software and/or hardware received from the customer.

Quality Record	Comment	Record Held By
Problem Reports on Customer-Supplied Products		Team Lead

4.3 Process and product metric analysis*

It is a requirement to collect the metrics described in Appendix G, at a minimum. Additionally, product metrics, Team process metrics, and ISD metrics may be collected. Describe how you will use these metrics for process improvement (see Library of Approved Team Processes or Criteria 10 in Appendix F).

Quality Record	Comment	Record Held By
Data and Completed Forms Representing the Required Metrics		Team Lead

5.0 Product Development Journals

5.1 Team Lessons Learned

Maintain a log of lessons learned throughout the life cycle of the team activities. The final lessons learned report is intended to be a brief (about one-half page) summary of the key recommendations for changes or inclusion in future similar projects.

Objective Evidence	Comment	Record Held By
Lessons Learned Log or document		Team Lead

5.2 Key Issues, Decisions, and Rationale

Maintain a log of key issues, decisions, and rationale through the life cycle of the Team.

Objective Evidence	Comment	Record Held By
Log of Key Issues, Decisions, rationale		Team Lead

*Items may be included by reference

Appendix A: Acronyms and Abbreviations

Appendix B: References

Include a list of any references used in the Product Plan.